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EXAMINER	
SCHLIENTZ, LEAH H	
ART UNIT	**PAPER NUMBER**
1618	
NOTIFICATION DATE	**DELIVERY MODE**
12/08/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

euspto@slspatents.com

Office Action Summary	Application No. 10/590,590	Applicant(s) SANTRA ET AL.	
	Examiner Leah Schlientz	Art Unit 1618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 November 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-12,14,15,18-21,23,25,29-36,38,39,41 and 51-53* is/are pending in the application.

4a) Of the above claim(s) *18-21,23,25,29-36,38,39 and 41* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-9,11,12,14 and 51-53* is/are rejected.

7)☒ Claim(s) *10 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/31/2009 and 7/16/2009*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Group I in the reply filed on 11/5/2010 is acknowledged. Claims 1, 2, 4-12, 14, 15, 18-21, 23, 25, 30-36, 38, 39, 41 and 51-53 are pending, of which claims 18-21, 23, 25, 30-36, 38, 39 and 41 are withdrawn from consideration as being drawn to a non-elected invention. Claims 1, 2, 4-12, 14, 15 and 51-53 are readable upon the elected invention and are examined herein on the merits for patentability.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 9, 11, 51-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Yang *et al.* (*Applied Phys. Letters*, 2003, 82(12), p. 1965-1967).

Yang discloses CdS:Mn/ZnS core shell quantum dots that were prepared using a reverse micelle route. Surface passivation of a CdS:Mn core by a wider band gap material, ZnS led to suppressed nonradiative recombination and significantly enhanced luminescence intensity (page 1967, right column).

It is noted that the recitation of the intended use of the quantum dots as a contrast agent has not been given patentable weight to distinguish over Yang because the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). Since Yang discloses compounds meeting the structural requirements of the instant claims, they would be capable of performing the intended use, as claimed.

It is further noted that Yang does not specifically recite that the quantum dot is fluorescent, radio-opaque and paramagnetic. However, when a structure recited in a reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent, see MPEP 2112.01. "Products of identical chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). It is further noted that the specification at published paragraph 0091-0092 states that highly water-dispersible, multifunctional CdS:Mn/ZnS core-shell Qdots prepared using microemulsion methods are fluorescent, radio-opaque and paramagnetic, and that the Qdots were synthesized following Yang's procedure (*Appl. Phys. Lett*, 2003, 82, p. 1965-1967).

Regarding claim 51, the quantum dots may in solution may be "implanted" or "deployed." Regarding claims 52-53, the quantum dots are present within aqueous reverse micelle solution, which is within the scope of a carrier. Water or surfactants within the solution are considered to be within the scope of pharmaceutically active agents (e.g. water may treat dehydration).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 5-9, 11, 12 and 51-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang *et al.* (*Applied Phys. Letters*, 2003, 82(12), p. 1965-1967) in view of Weiss *et al.* (US 5,990,479).

Yang teaches CdS:Mn/ZnS core shell quantum dots that were prepared using a reverse micelle route. Surface passivation of a CdS:Mn core by a wider band gap

material, ZnS led to suppressed nonradiative recombination and significantly enhanced luminescence intensity (page 1967, right column).

Yang does not specifically recite that the CdS:Mn/ZnS core shell quantum dots include an amine-functionalized silica coating and a targeting moiety.

Weiss teaches luminescent semiconductor nanocrystal compounds capable of linking to an affinity molecule to form an organo luminescent semiconductor nanocrystal probe capable of luminescence and/or absorption and/or scattering or diffracting when excited by an electromagnetic radiation source (of broad or narrow bandwidth) or a particle beam, and capable of exhibiting a detectable change in absorption and/or of emitting radiation in a narrow wavelength band and/or scattering or diffracting when so excited (column 1, lines 15-37). Treatment of a material with the organo luminescent semiconductor nanocrystal probe, and subsequent exposure of this treated material to excitation energy (from either a particle beam or an electromagnetic radiation source of broad or narrow bandwidth) to determine the presence of the detectable substance within the material, will excite the semiconductor nanocrystals in the organo luminescent semiconductor nanocrystal probe bonded to the detectable substance, resulting in the emission of electromagnetic radiation of a narrow wavelength band and/or a detectable change in the amount of energy being absorbed and/or scattered or diffracted, signifying the presence, in the material, of the detectable substance bonded to the organo luminescent semiconductor nanocrystal probe (column 1, lines 54+). The semiconductor nanocrystals useful in the practice of the invention include nanocrystals of Group II-VI semiconductors such as CdS, CdSe, CdTe, HgS, HgSe, HgTe, etc. In a

preferred embodiment, the nanocrystals are used in a core/shell configuration wherein a first semiconductor nanocrystal forms a core ranging in diameter, for example, from about 20 Å to about 100 Å, with a shell of another semiconductor nanocrystal material grown over the core nanocrystal to a thickness of, for example, 1-10 monolayers in thickness. When, for example, a 1-10 monolayer thick shell of CdS is epitaxially grown over a core of CdSe, there is a dramatic increase in the room temperature photoluminescence quantum yield (column column 5, line 60 – column 6, line 35). The particular affinity molecule forming a part of the organo-luminescent semiconductor nanocrystal probe of the invention will be selected based on its affinity for the particular detectable substance whose presence or absence, for example, in a biological material, is to be ascertained. Basically, the affinity molecule may comprise any molecule capable of being linked to a luminescent semiconductor nanocrystal compound which is also capable of specific recognition of a particular detectable substance. Such affinity molecules include, by way of example only, such classes of substances as monoclonal and polyclonal antibodies, nucleic acids (both monomeric and oligomeric), proteins, polysaccharides, and small molecules such as sugars, peptides, drugs, and ligands (column 6, lines 50+). There must be some type of linking agent present in the organo-luminescent semiconductor nanocrystal probe which is capable of forming a link to the inorganic semiconductor nanocrystal as well as to the organic affinity molecule in the organo-luminescent semiconductor nanocrystal probe. One form in which the semiconductor nanocrystal may be linked to an affinity molecule via a linking agent is by coating the semiconductor nanocrystal with a thin layer of glass, such as silica (SiO_x

where x=1-2), using a linking agent such as a substituted silane, e.g., 3-mercaptopropyl-trimethoxy silane to link the nanocrystal to the glass. The glass-coated semiconductor nanocrystal may then be further treated with a linking agent, e.g., an amine such as 3-aminopropyl-trimethoxysilane, which will function to link the glass-coated semiconductor nanocrystal to the affinity molecule. That is, the glass-coated semiconductor nanocrystal may then be linked to the affinity molecule (column 7-8). See also example 2.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a coating, such as an amine functionalized silica coating, on the CdS:Mn/ZnS core/shell quantum dot nanocrystals taught by Yang. One would have been motivated to do so because Weiss teaches that by coating semiconductor nanocrystals (i.e. preferably including core/shell structures) with such coatings and linking an affinity molecule thereto, the semiconductor nanocrystals are useable as a probe to determine the presence of a detectable substance in a material. One would have had a reasonable expectation of success in doing so because Weiss teaches CdS and ZnS as useable semiconductor materials, and also teaches the desirability of semiconductor nanocrystals capable of emitting light within a narrow wavelength band of about 40 nm or less, preferably about 20 nm or less, thus permitting the simultaneous use of a plurality of differently colored organo luminescent semiconductor nanocrystal probes with different semiconductor nanocrystals without overlap. The narrow emission bands of the CdS:Mn/ZnS quantum dots are well shown by Yang (e.g. Figure 3).

It is noted that the recitation of the intended use of the quantum dots as a contrast agent has not been given patentable weight to distinguish over Yang because the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). Since Yang discloses compounds meeting the structural requirements of the instant claims, they would be capable of performing the intended use, as claimed.

It is further noted that Yang does not specifically recite that the quantum dot is fluorescent, radio-opaque and paramagnetic. However, when a structure recited in a reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent, see MPEP 2112.01. "Products of identical chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). It is further noted that the specification at published paragraph 0091-0092 states that highly water-dispersible, multifunctional CdS:Mn/ZnS core-shell Qdots prepared using microemulsion methods are fluorescent, radio-opaque and paramagnetic, and that the Qdots were synthesized following Yang's procedure (*Appl. Phys. Lett*, 2003, 82, p. 1965-1967).

Regarding claim 51, the quantum dots may in solution may be "implanted" or "deployed." Regarding claims 52-53, the quantum dots are present within aqueous reverse micelle solution, which is within the scope of a carrier. Water or surfactants within the solution are considered to be within the scope of pharmaceutically active agents (e.g. water may treat dehydration).

Claims 1, 2, 4, 5, 6, 9, 11, 12 and 51-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang *et al.* (*Applied Phys. Letters*, 2003, 82(12), p. 1965-1967) in view of Nie *et al.* (US 2005/0136258), in further view of Kotov (US 6,689,338).

Yang teaches CdS:Mn/ZnS core shell quantum dots that were prepared using a reverse micelle route, as set forth above.

Yang does not specifically teach that a coating / targeting moiety, such as folic acid is present on the quantum dots.

Nie teaches nanostructures including a quantum dot and a hydrophobic protection structure. The hydrophobic protection structure includes a capping ligand and an amphiphilic copolymer, where the hydrophobic protection structure encapsulates the quantum dot (paragraph 0005). Also disclosed are methods of detecting a target in a subject includes: providing one of the nanostructures described above having a bio-compatibility compound disposed substantially on the surface of the hydrophobic protection structure, and at least one probe disposed substantially on the surface of the hydrophobic protection structure, wherein a first probe has an affinity for the target; introducing the nanostructure to a subject; and determining the presence of the target in

the subject corresponding to the probe by detecting the nanospecies (paragraph 0008). Figure 3 illustrates a schematic of biconjugated quantum dots for in vivo cancer targeting and imaging (paragraph 0013). The nanostructures can be modified so that the nanostructures interact with certain target molecules, which allow detection of the target molecules (e.g., in-vivo) thereby determining the area in which the target molecules are located, for example (paragraph 0023). The nanostructure can include quantum dots such as, but not limited to, luminescent semiconductor quantum dots. In general, quantum dots include a core and a cap, however, uncapped quantum dots can be used as well. The "core" is a nanometer-sized semiconductor. While any core of the IIA-VIA, IIIA-VA or IVA-IVA, IVA-VIA semiconductors can be used in the context of the present disclosure, the core must be such that, upon combination with a cap, a luminescent quantum dot results. A IIA-VIA semiconductor is a compound that contains at least one element from Group IIB and at least one element from Group VIA of the periodic table, and so on. The core can include two or more elements. In one embodiment, the core is a IIA-VIA, IIIA-VA or IVA-IVA semiconductor that ranges in size from about 1 nm to about 20 nm. In another embodiment, the core is more preferably a IIA-VIA semiconductor and ranges in size from about 2 nm to about 10 nm. For example, the core can be CdS, CdSe, CdTe, ZnSe, ZnS, PbS, PbSe or an alloy (paragraph 0031). The "cap" is a semiconductor that differs from the semiconductor of the core and binds to the core, thereby forming a surface layer on the core. The cap can be such that, upon combination with a given semiconductor core a luminescent quantum dot results. The cap should passivate the core by having a higher band gap

than the core. In one embodiment, the cap is a IIA-VIA semiconductor of high band gap. For example, the cap can be ZnS or CdS. Combinations of the core and cap can include, but are not limited to, the cap is ZnS when the core is CdSe or CdS, and the cap is CdS when the core is CdSe. Other exemplary quantum does include, but are not limited to, CdS, ZnSe, CdSe, CdTe, CdSe.sub.xTe.sub.1-x, InAs, InP, PbTe, PbSe, PbS, HgS, HgSe, HgTe, CdHgTe, and GaAs (paragraph 0032). In particular, when the nanospecies is a quantum dot, the hydrophobic protection layer includes the capping ligand and the block copolymer, where the capping ligand and the block copolymer interact with one another to form the hydrophobic protection structure. As such, the capping ligand and the block copolymer are selected to form an appropriate hydrophobic protection structure (paragraph 0036). The nanostructure can be attached to a probe molecule. The probe molecule can be any molecule capable of being linked to the nanostructure either directly or indirectly via a linker. The probe molecule can be attached by any stable physical or chemical association to the nanostructure directly or ndirectly by any suitable means. The probe molecule has an affinity for one or more target molecules (e.g., cancer cell) for which detection (e.g., determining the presence of and/or proximal position within the vessel (body)) is desired. The probe molecule and the target molecule can include, but are not limited to, polypeptides (e.g., protein such as, but not limited to an antibody (monoclonal or polyclonal)), nucleic acids (both monomeric and oligomeric), polysaccharides, sugars, fatty acids, steroids, purines, pyrimidines, drugs (e.g., small compound drugs), ligands, or combinations thereof (paragraph 0049-0051). Multifunctional nanoparticle probes based on semiconductor

quantum dots (QDs) have been developed for cancer targeting and imaging in living animals. The structural design involves encapsulating luminescent QDs with an ABC triblock copolymer, and linking this amphiphilic polymer to tumor targeting ligands and drug-delivery functionalities (paragraph 0081).

Kotov teaches that folic acid and small peptides such as somatostatin (Ala-Gly-Cys-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Phe-Thr-Ser-Cys) with distinct affinity to cancer cells are to be considered for conjugation to nanoparticles (column 11, line 21). Small peptides (somatostatin and its analogs), folic acid, bleomycin and other low molecular weight compounds with distinct tendency to accumulate in cancer cells (column 12, lines 45+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a coating / targeting moiety on the CdS:Mn/ZnS core/shell quantum dots disclosed by Yang. One would have been motivated to do so because Nie teaches that encapsulating luminescent QDs with an ABC triblock copolymer, and linking this amphiphilic polymer to a tumor-targeting ligand allows for in vivo imaging and treatment. One would have had a reasonable expectation of success in doing so because Nie teaches that a variety of core/shell quantum dots can be employed as the luminescent quantum dot, including CdS/ZnS core/shell structures (paragraph 0032), and also teaches that the wavelength emitted (i.e., color) by the quantum dots can be selected according to the physical properties of the quantum dots, such as the size and the material of the nanocrystal. Quantum dots are known to emit light from about 300 nanometers (nm) to 1700 nm (e.g., UV, near IR, and IR) (paragraph 0033). It would

have been further obvious to employ folic acid as a functionally equivalent cancer targeting moiety when the teachings of Yang and Nie are taken in view of Kotov, who teaches that folic acid is a cancer targeting moiety which can be conjugated to nanoparticles.

It noted that Yang does not specifically recite that the quantum dot is fluorescent, radio-opaque and paramagnetic. However, when a structure recited in a reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent, see MPEP 2112.01. "Products of identical chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). It is further noted that the specification at published paragraph 0091-0092 states that highly water-dispersible, multifunctional CdS:Mn/ZnS core-shell Qdots prepared using microemulsion methods are fluorescent, radio-opaque and paramagnetic, and that the Qdots were synthesized following Yang's procedure (*Appl. Phys. Lett*, 2003, 82, p. 1965-1967).

Claims 1, 2, 5, 6, 9, 11, 12, 14 and 51-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yang *et al.* (*Applied Phys. Letters*, 2003, 82(12), p. 1965-1967) in view of Svarovsky *et al.* (US 2008/0039816).

Yang teaches CdS:Mn/ZnS core shell quantum dots that were prepared using a reverse micelle route. Surface passivation of a CdS:Mn core by a wider band gap

material, ZnS led to suppressed nonradiative recombination and significantly enhanced luminescence intensity (page 1967, right column).

Yang does not specifically recite that the CdS:Mn/ZnS core shell quantum dots are coated with a carbohydrate, such as galactose.

Svarovsky teaches that quantum dots are small semiconductor particles that exhibit quantum confinement. Quantum dots can be made to luminesce at their characteristic wavelength by exposing them to light having a wavelength shorter than the characteristic wavelength. The essential part of the quantum dot is a nanocrystalline core (paragraphs 0002-0004). To increase the quantum efficiency of a nanocrystalline core, and thereby enhance the intensity of luminescence, the nanocrystalline core can be overcoated with a shell layer of a semiconductor material which has a band gap greater than the band gap of the nanocrystalline core. A quantum dot having both a nanocrystalline core and a shell layer can be referred to as a core/shell quantum dot (paragraph 0006). Chemical groups, including groups which have an effect on a biological system, can be bound to the surface of a nanocrystalline core or a shell of a quantum dot, which makes them of great interest in the development of new materials and techniques for biological research and medical diagnosis (paragraph 0007). Coupling of receptors to cell-surface saccharides mediates many relevant biological processes, including differentiation, motility, adhesion, tumor progression and metastasis. Therefore, quantum dots functionalized with saccharides are of interest for biological research, medical diagnostic and therapeutic applications (paragraph 0016). The invention provides novel biofunctionalized quantum dots which

luminesce brightly, are hydrophilic, and are stable in aqueous solution, and provides quantum dots which have saccharides linked to the surface of a nanocrystalline core or shell (paragraph 0019). The biofunctional group on a quantum dot can be a saccharide, for example a tumor associated carbohydrate; a Thomsen-Friedenreich (T_f) disaccharide (paragraph 0021). The quantum dot can be dissolved or suspended in a liquid (paragraph 0024) or can be linked to the surface of a device to form a coating on the device (paragraph 0027). Examples of core materials include cadmium sulfide, etc., and can also be doped with one or more suitable dopants (paragraph 0080). A shell layer overcoating and surrounding a nanocrystalline core may be present, including zinc sulfide, etc (paragraph 0081). See figures and examples for galactose containing saccharides conjugated to CdSe/ZnS quantum dots, as well as galactose-peg-HgTe.

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a coating comprising a saccharide (e.g. galactose) on the CdS:Mn/ZnS core/shell quantum dots disclosed by Yang. One would have been motivated to do so because Svarovsky teaches that quantum dots functionalized with saccharides are of interest for biological research, medical diagnostic and therapeutic applications (paragraph 0016) and that luminescent biofunctionalized quantum dots can therefore be imaged in a method of medical imaging, such as luminescing quantum dots adhered to a secretion of biological material can be imaged (e.g. cell culture or in vivo) (paragraph 0025). One would have had a reasonable expectation of success in doing so because Svarovsky teaches that the core of the quantum dot to be biofunctionalized

can include CdS, including doped nanocrystals, and that suitable shell materials include ZnS.

It is noted that Yang does not specifically recite that the quantum dot is fluorescent, radio-opaque and paramagnetic. However, when a structure recited in a reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent, see MPEP 2112.01. "Products of identical chemical composition can not have mutually exclusive properties." A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). It is further noted that the specification at published paragraph 0091-0092 states that highly water-dispersible, multifunctional CdS:Mn/ZnS core-shell Qdots prepared using microemulsion methods are fluorescent, radio-opaque and paramagnetic, and that the Qdots were synthesized following Yang's procedure (*Appl. Phys. Lett*, 2003, 82, p. 1965-1967).

Claim Objections

Claims 10 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

No claims are allowed at this time.

The following references are made of record as being relevant to the instant invention: US 4,466,896 and US 2005/0265922.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leah Schlientz whose telephone number is (571)272-9928. The examiner can normally be reached on Monday-Tuesday and Thursday-Friday 9 AM-5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Hartley can be reached on 571-272-0616. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael G. Hartley/
Supervisory Patent Examiner, Art Unit 1618

LHS